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# Science to Solutions

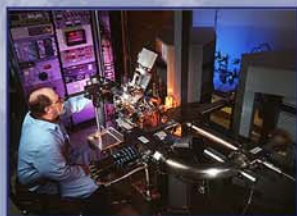
At Pacific Northwest National Laboratory, science and technology enable advanced solutions for the most difficult challenges we face in protecting our country against threats to national security. Never before in the history of the United States has it been more important to monitor the activity of rogue nations and terrorist groups. Advanced science and technology give our nation key tactical advantages in monitoring, detecting, gathering information, and maintaining the deterrent against weapons of mass destruction.

## Critical Challenges and Timely Opportunities

Potential adversaries can employ new technology, concealment, and deception to thwart our defenses and take advantage of our open society. Meeting these challenges requires the best and brightest scientific talent, new ideas, and demonstrated ability to deliver effective solutions. Our national security programs are backed by strong technical capabilities in several key scientific areas.

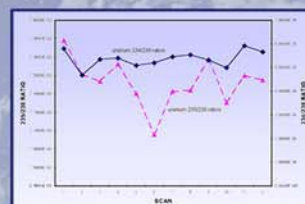
## Monitoring the Threat

Pacific Northwest National Laboratory has developed treaty monitoring instruments that reduce the global danger from weapons of mass destruction, enhance international nuclear safeguards, promote nuclear nonproliferation, and help eliminate inventories of surplus nuclear weapons materials.



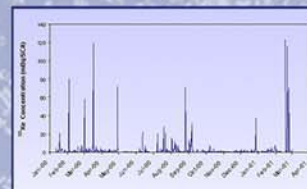
Our cover photograph highlights an exceptionally sensitive thermal ionization mass spectrometer that we use to measure the isotopic content of special environmental samples from worldwide monitoring.

Changes in isotopic ratios, measured by the thermal ionization mass spectrometer, provide essential information about the ongoing production and testing of nuclear devices.

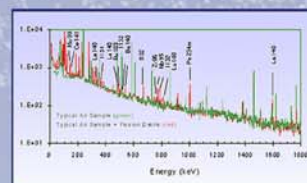


To an extent never before possible, we can pinpoint the locations of nuclear testing using two devices developed at Pacific Northwest National Laboratory. The Automated Radioxenon Sampler Analyzer and the Radionuclide Aerosol Sampler/Analyzer are being deployed worldwide to verify international compliance with nuclear treaties. These two breakthrough technologies permit fast, accurate, and economical detection of radionuclides emitted from nuclear detonations. The Automated Radioxenon Sampler Analyzer is about 100 times more sensitive than other common measurement systems for detecting fission products from underground nuclear testing. These instruments will be located around the world to monitor proliferation of nuclear weapons.

Background measurements of  $^{133}\text{Xe}$ ,  $^{131\text{m}}\text{Xe}$ ,  $^{133\text{m}}\text{Xe}$ , and  $^{135}\text{Xe}$  discriminate normal commercial reactor operations from underground nuclear weapons detonations. We have developed the first instrument capable of measuring all of the xenon isotopes with high sensitivity.



Air samples provide strong evidence of tests conducted in or leaking into the atmosphere. Any one of the small red peaks in this radioisotope spectrum would individually constitute a confident detection. Taken together, they form incontrovertible proof of testing.



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PACIFIC NORTHWEST NATIONAL LABORATORY  
*operated by*  
BATTELLE  
*for the*  
UNITED STATES DEPARTMENT OF ENERGY  
*under Contract DE-AC06-76RL01830*

**Printed in the United States of America**

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**Available to the public from the National Technical Information Service,**  
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PNNL-13750



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# **Pacific Northwest National Laboratory Institutional Plan FY 2002-2006**

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E. W. Pearson

January 2002

Prepared for the  
U.S. Department of Energy  
under Contract  
DE-AC06-76RL01830

Pacific Northwest National Laboratory  
Richland, Washington 99352



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